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A Study on The Reality of e-Learning for Chemistry Students During The COVID-19 Pandemic

Wedad Al-Dahhan[1], Khalid Zainulabdeen[1], Emad Yousif[1*], Ahmed Alamiery[2,3], Muna Bufaroosha[4]

[1)]Department of Chemistry, College of Science, Al-Nahrain University, Baghdad 64021, Iraq

[2)]Department of Chemical and Process Engineering, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, Bangi 43600, Selangor, Malaysia

[3)]Energy and Renewable Energies Technology Center, University of Technology, Baghdad 10001, Iraq

[4)]Department of Chemistry, College of Science, UAE University, Al-Ain, UAE

* E-mail Corresponding Author: emad_yousif@hotmail.com

Abstract

In a survey conducted by the Department of Chemistry on the reality of e-learning, which became widespread in most international universities during the COVID-19 pandemic in 2020, up to 50 students participated to express their thoughts and confirm observations. This survey was crucial in determining the importance of e-learning for the continuity of education and its potential drawbacks. The students' opinions were collected using specific questions designed for a questionnaire. The survey's key findings can be summarized as follows: Both students and teaching staff played pivotal roles in the success of e-learning. Additionally, the availability of logistical tools and infrastructure that facilitated communication between students and lecturers proved vital to the effectiveness of online learning.

Keywords: chemistry; education; e-learning; online learning

Abstrak

Survei yang dilakukan oleh Departemen Kimia tentang realitas *e-learning* yang tersebar luas di sebagian besar universitas internasional selama pandemi COVID-19 pada tahun 2020, sebanyak 50 mahasiswa berpartisipasi untuk mengungkapkan pemikiran mahasiswa dan mengkonfirmasi pengamatan. Survei ini sangat penting dalam menentukan pentingnya *e-learning* bagi kelangsungan pendidikan dan potensi kelemahannya. Pendapat mahasiswa dikumpulkan dengan menggunakan pertanyaan spesifik yang dirancang untuk kuesioner. Temuan utama survei ini dapat diringkas sebagai berikut: Baik mahasiswa maupun dosen memainkan peran penting dalam keberhasilan *e-learning*. Selain itu, ketersediaan alat dan infrastruktur logistik yang memfasilitasi komunikasi antara mahasiswa dan dosen terbukti penting untuk efektivitas pembelajaran *online*.

Kata kunci: kimia; pendidikan; e-learning; pembelajaran online

Introduction

The world has experienced rapid technological, technical, and information advancements across various cultures in recent years. The COVID-19 pandemic has significantly impacted different aspects of life, particularly education. To restrain the spread of the virus, educational institutions, including universities, had to close their entrances, causing serious concern among educators and students (Bozkurt et al., 2020; Chen et al., 2020).

As a result, online education emerged as the swiftest solution to maintain the continuity of learning (Bawa'Aneh, 2021). Many countries, including Iraq, adopted this approach, allowing students to continue their education remotely, ensuring their academic future despite the challenges posed by the pandemic (Yulia, 2020).

The COVID-19 pandemic has led to a surge in new educational skills and experiences among learners (Sari et al., 2020). However, it has also caused psychological and physical academic challenges (Anokhin et al., 2021). Nevertheless, by adopting proper planning, identifying needs, addressing financial issues, and receiving support from capable forces, virtual education can be developed and utilized as an educational supplement alongside traditional face-to-face learning (Nahid, 2020).

According to Nahid (2020), many students believe that face-to-face education is superior to online learning due to the following reasons:

1- The ability to benefit from the teacher-student connection and observe body language.
2- The student's sense of responsibility and commitment to stay on track with their studies.
3- Free from logistical problems related to internet connectivity and access.
4- Free from difficulties associated with electronic exams and assessments.

Method

In 2020, 50 students participated in expressing their thoughts and confirming observations regarding the significance of education continuity and its implications, addressing some of the challenges associated with the educational process. To gather these opinions, a questionnaire was designed specifically for this purpose. The key elements highlighted in the learners' responses indicated that students and teaching staff played crucial roles in decision-making. Additionally, the infrastructure facilitating communication between students and lecturers was deemed valuable.

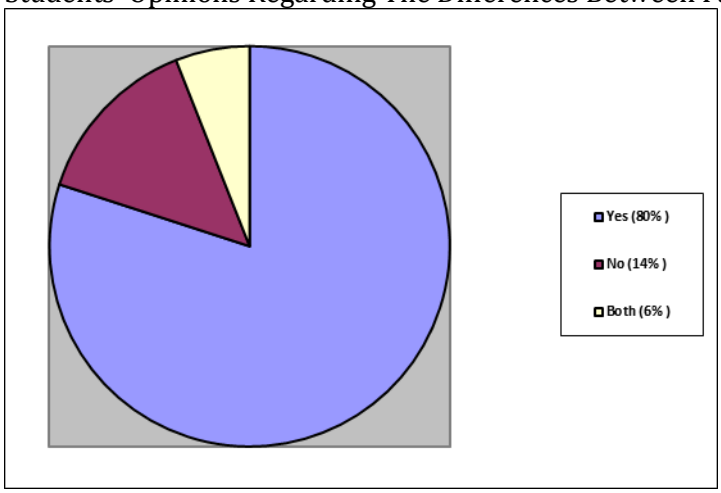
Furthermore, extensive laboratory practice holds significant priority for the Department of Chemistry students. Engaging in laboratory classes helps them grasp complex theories and principles in chemistry (Khalid et al., 2021). Moreover, this practice fosters a scientific attitude while providing essential experience in handling chemicals safely and utilizing chemical devices (Hofstein et al., 2017). It is well-established in the existing literature that laboratory lessons are integral components of higher-education level chemistry (Hofsteinthe, 2014).

Result and Discussion

The results of the questionnaire on the differences between face-to-face and online education are shown in Figure 1. Scientific lessons, particularly chemistry, incorporate practical aspects as a crucial and substantial part of the educational process for the course. While the theoretical curriculum was covered through e-learning methods, the practical component focused on fostering students' skills through hands-on laboratory experiments conducted in specialized facilities.

To ensure the safety and well-being of students, the educational institution has taken an important decision to limit the number of attendees in the laboratories, enforce social distancing, and implement health measures. Meanwhile, the theoretical side of the course remained accessible through an electronic platform.

Figure 1.
Students' Opinions Regarding The Differences Between Face-to-Face and Online Education

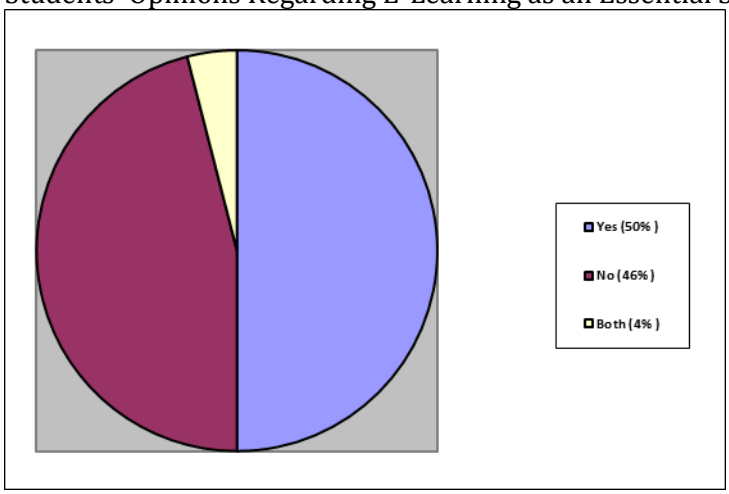


E-learning as an Essential Stage

Berg and Simonson (2023) define distance education as an interactive system integrated into the educational process, heavily relying on an electronic environment .This system utilizes electronic networks and smart devices to provide learners with courses and activities (Berg and Simonson, 2023).

According to the survey results, 50% of the students expressed that e-learning provided them with the essential tools they needed for their studies. On the other hand, the remaining students disagreed, stating that e-learning failed to offer the necessary courses, especially the fundamental ones. Figure 2 displays the students' opinions on this matter.

Figure 2.
Students' Opinions Regarding E-Learning as an Essential Stage



Student Attendance on The Online Platform

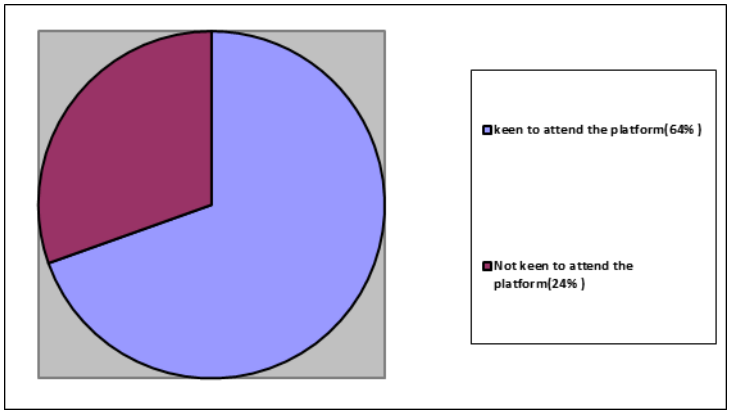
Google Classroom approved the platform, creating classes for each academic subject. In a question about the learners' commitment and their interest in being present and following up with the lecturer, 75% of the students revealed that they were not keen to attend the platform for the following reasons:

1- Attendance was of little use, as the electronic exam resolved the situation.
2- There was no commitment for students to be present.

3- Difficulty getting up in the morning, especially during the first lectures that started at half-past eight.
4- Negligence on the part of the students.
5- Noise and weak internet network service.

On the other hand, 25% of the students emphasized the importance of attendance to benefit from direct communication with the lecturer. Attending the lectures allowed them to ask questions directly and engage in interactive discussions, leading to fruitful brainstorming sessions (Motaghian et al., 2013). Actively participating in the lecture was also encouraged. Figure 3 presents the results of the questionnaire for this matter.

Figure 3.
Students' Attendance on The Online Platform



Explanatory Tools to Complement The Online Lectures

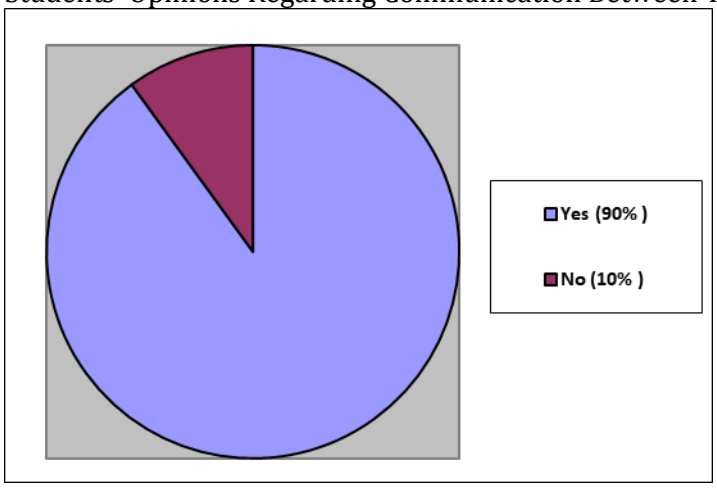
Most lecturers received high marks from the students due to their creative use of visuals, brief video clips, charts, and diagrams. These elements were utilized to enhance and enrich the substance of the lectures, resulting in a deeper comprehension of the material among the students. This approach played a significant role in overcoming some of the challenges associated with e-learning.

Communication between teaching staff and students

Most students highly valued the approachability of their teaching staff, who made themselves available through various platforms, with Telegram being the most notable one, even beyond regular class hours. This platform was effectively utilized to create groups or courses where students and lecturers could interact and discuss instructions and scientific inqueries related to the subject. However, this form of communication sometimes posed challenges, especially when certain students encountered issues with electricity, internet connectivity, or excessive background noise, making it challenging for them to participate at specific times. To provide a visual representation, Figure 4 illustrates the percentage of students' opinions regarding the communication between teaching staff and students.

In this particular context, students showed tremendous enthusiasm compared to others when attending classes in the same subject. This heightened interest could be attributed to the lecturer's proficiency, reflected in their dedication to overcoming e-learning challenges and the perceived significance of the subject, whether it was a primary or secondary focus (Ellis et al., 2013). Previously, some students expressed their reluctance to attend early morning classes, citing their displeasure for having to wake up early as a reason for their lack of interest in attending the first classes.

Figure 4.
Students' Opinions Regarding Communication Between Teaching Staff and Students



The Positive and Negative Consequences of Online Exams

Whether conducted daily, quarterly, or as final assessments, examinations are considered a crucial means of evaluating students. The prevailing method for administering exams involved giving students online questions in PDF format. Once the specified exam period elapsed, students submitted their answers to the examiner, who could be either the subject instructor or the examination committee (Chi & Wylie, 2014).

However, students raised concerns regarding the effectiveness of online exams, with approximately 95% expressing dissatisfaction. The main issues highlighted in this context are as follows:

1- Communication between students led to the exchange of answers.
2- The open-book nature of the exam made it less challenging.
3- A limited number of high-achieving students refrained from sharing their answers with others.
4- Students sometimes resorted to the internet to find general answers.

The students provided valuable suggestions on enhancing the online exam experience. These are as follows:

1- Utilizing multiple templates to diversify the exam structure.
2- Incorporating oral exams.
3- Enhancing students' self-confidence through their educational institution.
4- Implementing question formats with quick solutions and time constraints to ensure efficiency.
5- Arranging attendance exams with appropriate measures for social distancing and adhering to health protection guidelines.

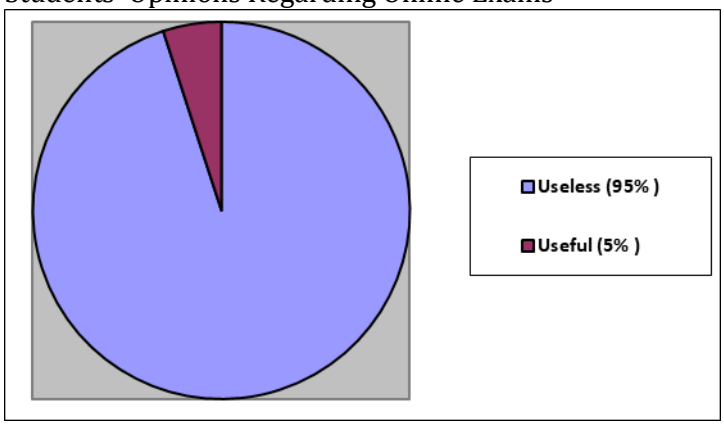
Figure 5 below displays the students' opinions about regarding online exams. During the COVID-19 pandemic that affected most countries worldwide, e-learning became a crucial tool adopted by many nations, including Iraq, to ensure the continuity of education and prevent students from missing out on their studies.

This pioneering study aimed to assess and report the advantages and drawbacks of e-learning during this critical period and its impact on education in Iraq. The researchers administered targeted questionnaires among the parties experiencing this reality firsthand: the students and the educators.

The survey was conducted by researchers from the Department of Chemistry at Al-Nahrain University in Baghdad, focusing on a group of students within the same department. The results highlighted the significance of e-learning during the pandemic. They emphasized investing in tools to enhance the experience, such as university platforms for students and

educators (Saroff, 2019). However, it was uncovered that students still preferred face-to-face education due to the usefulness of body language in communication and direct discussions with teachers.

Figure 5.
Students' Opinions Regarding Online Exams



Additionally, most students deemed electronic or online exams ineffective as they allowed for potential communication between students, raising concerns about the credibility of their answers. Despite these challenges, the data from this experience underscored the crucial role of e-learning in sustaining and continuing education amid a global pandemic. The results can be further studied, developed, and utilized to improve future e-learning strategies.

Conclusion

The COVID-19 pandemic, which originated in Wuhan, China, in December 2019, quickly became a global health crisis. The World Health Organization (WHO) declared it a public health emergency of international concern. To curb the spread of the virus, safety measures were imposed worldwide, affecting all sectors, including education. Due to social distancing requirements, educational institutions confronted significant challenges in maintaining traditional learning. Consequently, many turned to e-learning as a solution to continue delivering education. A questionnaire was subsequently distributed to approximately 50 university students to assess this transition's effectiveness. The aim was to gather their opinions and feedback on their e-learning experience with their instructors. Most students reported encountering substantial challenges with this type of education. The main issues were poor communication between learners and teachers and technical problems associated with operating technology for learning. A noteworthy finding from the study was the substantial differences between face-to-face instruction and online learning. Teachers and students collaborated with educational institutions to adapt to remote learning conditions, implemented across all countries affected by the pandemic. The nature of this stage required dealing with and coexisting within challenging time constraints. In conclusion, this research evaluated a crucial period in education and suggested potential improvements based on student feedback.

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